Stated Meeting, April 3.

Present, twenty-one members.

Judge Hopkinson, Vice President, in the Chair.

The following donations were received:—

FOR THE LIBRARY.

Proceedings of the Royal Astronomical Society. Vol. II. No. 2.—*From the Society.*

Address of the Most Noble the Marquis of Northampton, &c. &c., the President, read at the Anniversary Meeting of the Royal Society, on Saturday, Nov. 30, 1839.—*From the Royal Society.*

Transactions of the Agricultural and Horticultural Society of India. Vol. VI. 8vo. Calcutta, 1839.—*From the Society.*

The Journal of the Royal Geographical Society of London. Vol. IX. 1839. Part 3. 8vo. London, 1839.—*From the Society.*

Notes, taken during Travels in Africa, by the late John Davidson, F.R.S. F.S.A., &c. Printed for private circulation only. 4to. London, 1839.—*From Capt. John Washington*, of London.

Voyages of the Dutch Brig of War Dourga, through the Southern and little-known Parts of the Mohiccan Archipelago, and along the previously unknown Southern Coast of New Guinea, performed during the Years 1825 and 1826. By D. H. Kolff, Jun. Lieutenant ter Zee, 1e Klasse, en Ridder van de Militaire Willems Orde. Translated from the Dutch, by George Windsor Earl, Author of the "Eastern Seas." 8vo. London, 1840.—*From the same.*

The Statutes at Large of South Carolina; Edited under Authority of the Legislature, by David J. M'Cord. Vol. VI. Containing the Acts from 1814, exclusive, to 1838, inclusive. 8vo. Columbia, 1839.—*From Dr. P. Tidyman.*

Select American Speeches, Forensic and Parliamentary, with Prefatory Remarks: being a Sequel to Dr. Chapman's "Select Speeches." By S. C. Carpenter. Two Vols. 8vo. Philadelphia, 1815.—*From Mr. Vaughan.*

Sermons, Orations, and Eulogiums, by Various Individuals, in 1799 and 1800. Two Vols. 8vo. Philadelphia, 1800.—*From the same.*

A Voyage Round the World; including an Embassy to Muscat and Siam, in 1835, 1836 and 1837. By W. S. W. Ruschenberger, M. D., Surgeon U. S. Navy, &c. 8vo. Philadelphia, 1838.—*From Mr. Lea.*

The Philadelphia Book; or Specimens of Metropolitan Literature. 12mo. 1836.—*From Mr. Du Ponceau.*

Praktische Deutsche Sprachlehre zum Selbstunterricht und für Schulen. 12mo. Leipzig, 1801.—*From the same.*

My Prisons, Memoirs of Silvio Pellico of Saluzzo. Two Vols. 12mo. Cambridge, 1836.—*From the same.*

Ethnological Extracts from the Monthly Chronicle; containing a Paper, by Dr. Prichard, on the Extinction of Human Races, &c., and a Communication on the Practicability of Civilizing Aboriginal Populations.—*From Dr. Hodgkin.*

The London Athenæum, for December 28, 1839, containing the Meteorological Observations at the Apartments of the Royal Society, for Twenty-five Successive Hours, commencing at 6 A. M. Dec. 21, 1839, and ending at 6 A. M. of the following day. By Mr. J. D. Roberton, Assistant Secretary Royal Society.—*From Mr. Wm. Vaughan.*

Address, delivered by the Actuary, (Mr. Morgan) to the General Court of the Equitable Society, on Thursday, the 5th Dec. 1839, with Tables and Statements of Insurance on Lives, by the Society.—*From the same.*

The American Medical Library and Intelligencer. By Robley Dunglison, M. D., &c. Vol. III. Nos. 23 and 24, (which conclude the year) March 1 & 15. Philadelphia, 1840.—*From the Editor.*

Lecture on the Advantages derived from Cultivating the Arts and Sciences. By G. Emerson, M.D. Delivered before the Philadelphia Mercantile Library Association. Dec. 8, 1839. 8vo. pp. 22. Philadelphia, 1840.

FOR THE CABINET.

A Musical Reed Instrument, consisting of fourteen Bamboo Reeds, invented at Laos, and described in Ruschenberger's Voyage Round the World.—*Presented by Dr. Ruschenberger.*

The Committee, consisting of Dr. Patterson, Dr. Hare, and Prof. Bache, to whom was referred a paper entitled "On a new Principle in regard to the Power of Fluids in Motion to

produce Rupture of the Vessels, which contain them, and on the Distinction between Accumulative and Instantaneous Pressures; by Charles Bonnycastle, Professor of Mathematics in the University of Virginia," reported in favour of its publication in the Transactions of the Society, which was ordered accordingly.

Mr. Bonnycastle's investigation was suggested by a paper read by Dr. Hare, and printed in the Transactions of the Society, entitled "On the Collapse of a Reservoir, whilst apparently subject within to great Pressure from a Head of Water." Dr. Hare pointed out the circumstances attendant upon this curious occurrence, and showed how the vessel might have been momentarily relieved from the pressure of the water within, so as to make that of the surrounding air efficient in producing the collapse. The principal object of Mr. Bonnycastle's paper is to investigate the precise nature and degree of the forces brought into action in this and similar cases.

The results at which Mr. Bonnycastle arrived, are stated by him as follows:—

1. It is convenient to distinguish between accumulative and instantaneous loads, or between those which are gradually increased until the deflection due to the ultimate load is obtained, and those which commence in full efficacy from the initial position of the support.

2. Within the limits of perfect elasticity, instantaneous pressure produces twice the effect of that which is accumulative, whether the result be to produce deflection or fracture.

3. In regard to supports perfectly elastic in one direction, and perfectly flexible in the other, instantaneous action, at right angles to the axis of elasticity, produces a deflection which is to that of accumulative action as $\sqrt{4}$ to 1, whilst the tendencies to fracture are as 4 to 1. But should any case occur when the law of elasticity follows an extremely high power of the deflection, then the singular result will follow, that the deflections are the same, whether the force be exerted from the initial state or the state of load, but that the tendency to fracture will be immensely greater in the former case, than in the latter.

4. In producing the fracture of natural substances, which all depart from the law of perfect elasticity as we approach the limit of

fracture, the ratio of the effect of instantaneous and accumulative action will vary with the nature of the substance, never being less, for elastic bodies, than 2 to 1, nor for flexible than 4 to 1, and more usually approaching 3 or 4 to 1 for the former case, and 5 or 6 to 1 for the latter.

5. Let a vase or conduit be acted upon by a load which is alone sufficient to break it, and let this load be partly balanced by a small exterior force: should the great interior force suddenly cease, the small exterior action may crush the vase or conduit inward; its energy in such case being the sum of the interior and exterior forces.

6. Should the interior force be a vibration of the kind already explained, and should the exterior action be extremely feeble, and act on a very great mass, this extremely feeble action may crush the vase inward, with a power that shall exceed in any degree the enormous action of the interior or explosive vibration. The comparison of the interior and exterior actions is best effected in this case, by finding the modulus of elasticity of a material spring that shall coincide most nearly in effect with the interior tremor. For putting e and e' respectively for the modulus of the spring and of the support, and σ and σ' for the deflections resulting from the tremor acting alone, and the reaction as it does act, we have $\frac{\sigma'}{\sigma} = \sqrt{\frac{e}{e'}}$, or, in other words, the deflection produced by the reaction, is to the deflection that would be produced by the interior tremor alone, in the inverse proportion of the square roots of the moduli of tremor and support.

7. Combining what is here said with the known laws of fluids moving in pipes, and whereby they necessarily produce hydraulic shocks, it follows, that any vessel connected with such a train of pipes, and plunged at some little depth in a considerable mass of water, or other heavy fluid, will occasionally be subject to a crushing and exterior force vastly greater than the interior strain due to the constant head of fluid.

In illustration of the principles thus developed, Mr. Bonnycastle details some experiments, and mentions a phenomenon which occurred under his own notice, and is analogous to the one described by Dr. Hare. In making experiments on the propagation of sound through water, he had occasion to cause an explosion of gunpowder within a hollow metallic cylinder, open at the lower end, and immersed under the liquid; and, although the strength of the cylinder

was abundantly sufficient to bear the statical pressure of the surrounding water, he found it crushed inward after the explosion.

Judge Hopkinson deposited with the Society, the Log Book of the first voyage in a steam vessel across the Atlantic, by Captain Rogers, in the year 1819; an account of which was given in the Proceedings of the Society, No. 2, p. 14.

In a written communication, Judge Hopkinson stated, amongst other matters in reference to Captain Rogers's priority, that he was on board the steam ship, lying at the City of Washington, after her return from the voyage. She was built and rigged like one of the Liverpool packets; and her wheels were made to fold up at her sides, when the wind permitted her sails to be used.

The Log Book states, among the occurrences usually noted, the days when the steam was used.

Dr. Hare made some observations on Professor Loomis's views of storms, read at the last meeting; also, on the mode in which storms may be induced by the meeting of opposite currents, and the ascent of an intervening mass of air; on the agency of electricity in their production, &c. &c.

Dr. Hare asked permission to withdraw his paper, presented at the last meeting of the Society, which was agreed to.

He stated that he was about to perform some experiments, the results of which it appeared to him desirable to publish with his essays, and he was fearful that the subject could not be described satisfactorily without quotations from previous publications, which might not be consistent with the limits allowed to articles published in the Transactions.